Curved Lines and Surfaces, their Production

Mamurov Islam, Alimov Fakhriddin Husenovich, Khakimova Nilyufar Juraevna
Tashkent State Transport University

A B S T R A C T
The class of a plane curve is determined by the number of attempts made to it from an arbitrary point of this plane, and the class of a spatial curve is determined by the number of attempted planes made to it through a straight line.

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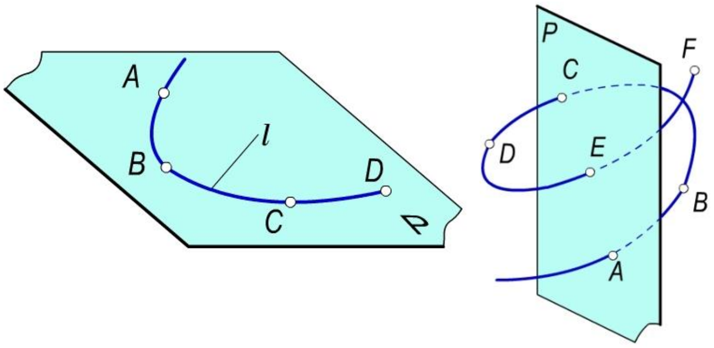
In drawing geometry, the practical use of geometric and mechanical properties of curves is taken into account, and a simple kinematic definition is given to them. Therefore, a curve is considered as a trace of a point moving continuously in a certain direction in space or on a plane.

Curves are divided into straight (Fig. 1,a) and spatial (Fig. 1,b) curves.



a) b)

Figure 1

Curves are divided into legal and illegal curves. If the set of points forming a curve obeys a certain law, it is legal, and if the set of points is not based on any law, such a curve is called a lawless curve. Depending on the equations of the legal curves in the Cartesian coordinate system, they are divided into algebraic and transcendental curves. A curve whose equation is expressed by an algebraic function is called an algebraic curve, and a curve whose equation is expressed by a transcendental function is called a transcendental curve.

Algebraic curves are characterized by the concepts of order and class. The order of the curves is equal to the degree of the equation representing it.

Graphically, the order of straight curves is determined by its straight line, and the order of a spatial curve is determined by the maximum number of points of its intersection with a plane.

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The order and class of the curve varies. Only second-order curvatures have the same order and class, which is equal to 2.

Flat curves can be presented in analytical and graphical forms. In an analytical form, it is given with the following points:

- with the polynomial f(x,u)=0 in the Cartesian coordinate system;
- with r=f(φ) in the polar coordinate system;
- with x=x(t) and u=u(t) in the parametric form.

There are different ways to represent curves graphically.

As a result of the continuous movement of a point belonging to the plane, a straight curve is formed. From each point of a straight curve, one trial and one normal can be transferred to it.

to the given straight curve ℓ, the test and normal transfer at one of its points A are shown. For this, we draw the straight lines AE and AF that intersect the curve through the point A. we begin to approach point A along a curved line. As a result, the intersection AE begins to rotate around the point A. When point y coincides with point A, the intercept t1 of AE is generated. It is called a half test performed at a given point on the ℓ curve. Moving point F on the curve, we overlap with point A. AF cutter t2 produces a half-effort. A straight line formed by half tests t1 and t2 in opposite directions is called a test performed at a given point on the curve. A curve formed by such points is called a smooth curve.

The straight line perpendicular to the point A of the curve is called its normal. Sometimes half-attempts can overlap without overlapping. Such points are called breaking points. In practice, there are a lot of problems with trying and normalizing curves, so let's try some graphical methods of trying and normalizing.

A parallel attempt to the given direction. In order to conduct an experiment parallel to a given ℓ direction s, the ℓ curve is cut by lines parallel to the s direction, and through the points that bisect the resulting vectors 111, 221, 331,... the error curve q will be held. The intersection point of curve q with ℓ is found B. t test is performed parallel to the given direction s through point B.

Passing a curve through a point lying on it. A given curve ℓ is intersected by straight lines from the point A lying on it. A straight line b is drawn perpendicular to the approximate direction of the attempt passing through point A. The length of the beam in ℓ of this line is measured from the points where it crosses the straight line b to the cutting rays. A set of points q forms a curve. The point of intersection of the curve q with b, connecting B with point A, is the result of the attempt t.

Evolute and involute If centers of curvature are drawn for all points of a curve ℓ, their collection forms the curve ℓ1. This curve ℓ1 is called the evolute of the given curve ℓ. The curve ℓ is called the involute with respect to the involute ℓ1).

The trials of the involute ℓ are the normals of the involute. An involute attempt can contain an infinite number of involutes. Therefore, the involute of a curve cannot determine its involute, but its involute can determine its involute.

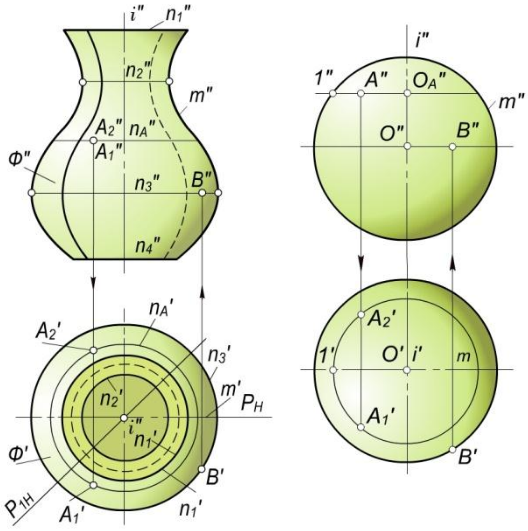

Figure 2

If the attempt made from the point of intersection of the parallel with the prime meridian to the prime meridian is parallel to the axis of rotation, this parallel is called the equator or the meridian. If this parallel is greater than the two adjacent parallels, it is called the equator, if it is smaller, it is called the meridian. So, a surface of revolution can have several equators and meridians. The rotation in Fig. 2 is on the surface parallel to n2(n2′,n2″), and n3(n3′,n3″) is the equator line.

A surface of revolution, like any other surface, consists of an infinite set of points. These points cannot be represented in a solid plot. That is why test cylinders are transferred to the surface of rotation perpendicular to H and V. The line of intersection of the test cylinders with N is called the horizontal outline of the surface, and the line of intersection with V is called its frontal outline. Surfaces of rotation are often described by their horizontal and frontal contours. The rotation in Fig. 2 is depicted by the frontal outline of the surface with the parallels of the prime meridian m″ and n1″, n4″, and the horizontal outline with the parallels n2′ and n3′.

Horizontal and frontal outlines also help to identify visible and invisible parts of surface projections.

Projections of points on the surface are found using parallels. For example, the frontal projections of points A1 and A2 belonging to the surface of revolution, the horizontal projections of A1″ and A2″, the horizontal projections of A1′ and A2″ nA, and the horizontal projection of the parallelogram n′A are defined in n′A.

The horizontal B′ projection of the point B lying on the equator is given. Its B″ frontal projection is in the n3″ frontal projection of the equator.

Rotating surfaces are widely used in engineering and construction practice. This is because most mechanisms are rotary, and turning surfaces are easily machined.

The largest parallel of the surface is called its equator, and the smallest parallel is called its longitude.

Depending on the function of the machine mechanisms to be designed, the technical requirements and shape, the manufacturer of the rotating surface is selected.

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